



Appl'n Serial No. 10/687,814  
Attorney Docket No. 03549.0088-01000

PATENT  
Customer No. 22,852  
Attorney Docket No. 03549.0088-01000

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

William C. COX et al.

Application No.: 10/687,814

Filed: October 20, 2003

For: CHEMICAL RESISTANT, WATER  
AND DRY PARTICLE  
IMPERVIOUS, FLAME  
RESISTANT LAMINATE

)  
)  
) Group Art Unit: 1771

) Examiner: Ula Corinna RUDDOCK

)  
)  
) Confirmation No.: 2634

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**DECLARATION UNDER 37 C.F.R. § 1.132**

I, Philip E. Harris, do hereby declare as follows:

1. I am a U.S. citizen, and I reside at 2804 Big Oak Court, High Point, NC 27265.
2. I am currently employed by Precision Fabrics Group of Greensboro, North Carolina, and have been employed by Precision Fabrics Group continuously since March 27, 1995.
3. I am one of the inventors named on United States Patent Application No. 10/687,814, filed October 20, 2003.
4. I have a B.S. in Biology from Harding University and M.S. in Chemistry from University of North Carolina at Greensboro.

5. Since starting work for Precision Fabrics Group, I have worked with laminates. Since March 1, 1996, I have been a research associate for laminated product development, including design, commercialization, raw material and finished product specification development, and support of manufacturing. I have also interfaced with adhesive suppliers to develop new products using alternative or new adhesive technologies.
6. Prior to working for Precision Fabrics Group, I worked as a chemist for Jowat Corporation of Archdale, North Carolina from May 16, 1988, to March 25, 1995. My responsibilities at Jowat included supervising Quality Assurance. In this position, I tested raw materials and finished adhesives and adjusted formulations for production control. I formulated and developed new hot melt and water-based adhesives, and physically tested submitted samples, and analyzed samples, by extraction and IR spectroscopy, for countertype matching.
7. I have read the range of adhesives disclosed to work in Example 1 of U.S. Patent No. 3,900,625 to Chen ("Chen"), col. 5, lines 14-67, as well as the description of Example 2 in col. 6, lines 1-15.
8. I prepared, or supervised the preparation of, sample composites according to Example 2 of Chen.
9. The 3 mil thick dioctyl phthalate plasticized polyvinyl chloride ("PVC") film was prepared as follows: One layer of 2 mil PVC film

was laminated to two layers of 0.5 mil PVC film using the belt laminator at 205 °C, 40 psi, and 24 seconds fusing time. The layers of PVC film were between two layers of silicone-line release paper.

10. The fire-resistant adhesive was prepared as follows: 600 grams of Rohm & Haas Robond PS-68, a 57% solids, pressure sensitive water-based adhesive were mixed with 8% of 70% chlorinated paraffin wax (48 grams) and 3% of antimony trioxide (18 grams). The components were mixed until smooth using a lab mixer with a propeller blade, resulting in 666 grams of a fire-resistant adhesive.
11. In my opinion and based on my experience, the Rohm & Haas Robond PS-68 is an acrylic, pressure sensitive, water-based adhesive that is equivalent to the adhesives disclosed by Chen, col. 5 lines 38-46, for the purposes of providing an acrylic, pressure sensitive adhesive that possesses resiliency, adhesiveness, and tack.
12. A 3 mil low density polyethylene ("LDPE") film was coated with the prepared fire-resistant adhesive using a 2 inch wide paint roller to completely cover the film surface and was allowed to dry overnight.
13. The 3 mil PVC film was taped down onto a layer of silicone release paper and the prepared fire resistant adhesive was

coated onto the film using the 2 inch wide paint roller to completely cover the PVC film surface.

14. A first layer of 420 Denier nylon yarns comprising 144 filaments per yarn were stretched across the PVC film. The nylon yarns were approximately ¼ inch apart.
15. A second layer of the same 420 Denier nylon yarn with the same spacing was stretched across the PVC film, over and perpendicular to the first layer.
16. A second layer of the prepared fire-resistant adhesive was rolled across the grid of noninterwoven nylon yarn, coating the yarns completely and was allowed to dry overnight.
17. The composite was prepared as follows: After drying completely over night, the LDPE film with fire-resistant adhesive was place adhesive side down over the PVC/nylon grid composite to form the final composite layer. This composite was smoothed out and firmly pressed by hand.
18. Samples were cut from the composite for the NFPA flammability test.
19. The NFPA 701-1989 test procedures are attached to this declaration as Exhibit 1.
20. A machine direction ("MD") sample and a cross direction ("XD") sample were tested according to NFPA 701-1989 and both failed the test.

21. The NFPA 701-1989 results follow:

<u>Sample</u>	<u>Char Length</u>
MD	9"
XD	7"

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: December 20, 2005

By: Philip C Harris  
Philip C. Harris

## NFPA 701

Standard Methods of Fire Tests for  
Flame-Resistant Textiles and Films

1989 Edition

Information on referenced publications can be found in Chapter 11.

## Chapter 1 General

## 1-1 Scope.

1-1.1 These requirements apply to flame-resistant materials that are used extensively in the interior of buildings, in protective clothing for certain occupations and situations, and for protective outdoor coverings such as tarpaulins and tents. The flame-resistant requirements are not dependent on the type of treatment; however, where durability to laundering or weathering is claimed, the fabric or film is tested for flame resistance after being subjected to the applicable cleaning or exposure procedures.

1-1.2 These requirements also apply to plastic films, with or without reinforcing or backing, when used for decorative or other purposes inside buildings or as temporary or permanent enclosures for buildings under construction.

1-1.3 These requirements may not apply to multilayered fabrics or assemblies of fabrics.

NOTE: Limited experience has shown that multilayered fabrics may burn in a manner that is different from that of the burning behavior of the individual components (see Appendix D). Many materials may meet the test criteria of this standard because they shrink away from the flame, melt, ablate, or otherwise fail to support upward flames when heated. However, when such materials are in contact with a material that meets the test criteria of this standard and do not shrink away from the flame but instead char and maintain a degree of structural integrity, the material in question may not be able to evade the flame and could support upward burning.

1-1.4 If these materials are to be applied to surfaces of buildings or backing materials as interior finishes for use in buildings, the test shall be conducted and the material classified in accordance with NFPA 255, *Method of Test of Surface Burning Characteristics of Building Materials*.

## 1-2 Purpose.

1-2.1 It is the purpose of these requirements to provide tests to assess the propagation of flame beyond the area exposed to the source of ignition.

1-2.2 These performance tests do not necessarily indicate whether the material tested will resist the propagation of flame under severe exposure or when used in a manner that differs substantially from the test conditions.

## 1-3 General Description.

1-3.1 Two methods of assessing flame propagation resistance are described. Both methods provide a comparison among materials but do not necessarily indicate the behavior of a material in a large building fire or other conflagration.

1-3.1.1 The small scale test employs a relatively small sample and small igniting flame. It is simple and convenient for general use. The small scale test is commonly used to indicate susceptibility to flame spread from small ignition sources, but may also be used as a screening test prior to large scale testing.

1-3.1.2 The large scale test requires a much larger sample and applies a more severe fire exposure, which will more nearly approach severe fire conditions. Initial screening may be done with the small scale test. This method is also useful for investigating the flammability of fabrics when hung in folds.

1-3.2 Materials that are expected to retain their flame resistance through drycleaning, laundering, water leaching, or weathering exposures shall be subjected to the procedures of Chapter 8 before being tested.

## 1-4 Test Selection.

1-4.1 All materials covered in the scope of this method shall be capable of complying with the performance requirements of either the small or the large scale tests or both. The authority having jurisdiction shall determine whether both tests are required, depending on the purpose to be served or the nature of the materials tested.

1-4.2 For materials that show excessive melting or shrinkage or ongoing combustion at the junction of the specimen and its holder in the small scale test, the large scale test shall be considered applicable.

1-4.3 In the conduct of the large scale test, only folded specimens shall be tested.

*Exception: Materials that cannot be readily prepared in the folded configuration shall be tested by the flat sheet portion of the large scale test, using the procedure specified in Chapter 6.*

Chapter 2 Test Apparatus and Materials for  
Small Scale Test

## 2-1 Conditioning Oven.

2-1.1 A forced draft oven shall be used to condition test specimens properly prior to testing.

2-1.1.1 The interior of the oven shall be large enough to provide free air flow around each specimen contained.

2-1.1.2 The oven shall have adjustable temperature control capable of maintaining the interior at a temperature of 140-145 °F (60-63 °C).

**2-2 Specimen Holder.** A metal holder having clamps applied to compress the holder lightly along its edges shall be used to support and align the specimen. The ends of the specimen shall remain free.

**2-3 Test Chamber and Gas Burner.**

**2-3.1** The test chamber, specimen holder, and burner shall be the metal cabinet, specimen holder, and burner specified for the Federal Children's Sleepwear Standard 16 CFR 1615.4 (FF 3-71).

**2-3.2** The gas supply to the burner shall be at least 97 percent methane or natural or manufactured gas having a heat value of 800-1000 Btu per cu ft.

**2-4 Hook and Weight.** A hook and weight assembly shall be used to determine the length of char or destruction of the specimen. The combined weight of the assembly shall follow Table 2-4.

Table 2-4

Weight of Material Being Tested (Ounces Per Square Yard)	Total Tearing Weight for Determination of Length of Char (Pounds)
Less than 2	0.12
2 to 6 inclusive	0.25
Over 6 and not exceeding 15	0.50
Over 15 and not exceeding 23	0.75
Over 23	1.00

**2-5 Timer.** Stop watches or other timing devices that measure to 0.5 second shall be used to determine afterflame of burning specimens and the flame time of portions of residues that break away or drip from the test specimen and continue to flame after reaching the floor of the test chamber.

**2-6 Hood.** A hood or other suitable enclosure shall be used to provide a draft-free environment around the tester. The hood or enclosure shall have a fan or other suitable means of exhausting smoke and fumes produced during testing.

**2-7 Pan Balance.** A pan balance capable of weighing to the nearest 0.01 g shall be used for weighing specimens.

**2-8 Test Specimens.**

**2-8.1** Five specimens of material, 3½ by 10 in., shall be cut with their long dimension parallel to the length direction, and five with the long dimension parallel to the width direction.

**2-8.2** Each lot of five shall be cut from at least five places in the sample separated sufficiently to give indication as to the uniformity of the flammability performance.

**2-8.3** No specimens nearer the selvage than ¼ of the width of the sample shall be used for testing.

**Chapter 3 Flame Test Procedures for Small Scale Test**

**3-1 Conditioning of Test Specimens.**

**3-1.1** The test specimens shall be conditioned in an oven at temperatures of 140-145 °F (60-63 °C) for durations of not less than one hour nor more than one and one-half hours prior to mounting in the specimen holder and testing.

**3-1.2** Materials that distort or melt at the above indicated oven exposure are to be conditioned at 60-80 °F (15-27 °C) and 25-50 percent relative humidity for not less than 24 hours.

**3-1.3** Specimens shall be removed from the oven one at a time, mounted in the specimen holder, and subjected to the procedures described in Sections 3-2 and 3-3 within 30 seconds.

**3-2 Mounting of Test Specimens.**

**3-2.1** Materials that are specified as being for use only as curtains and draperies and weighing less than 3.0 oz/yd² shall be weighed to the nearest 0.01 g prior to mounting in the specimen holder.

**3-2.2** The specimens shall be placed on the specimen holder and clamped so that a strip 2 in. wide and 10 in. long is left exposed.

**3-2.3** The specimen and its holder shall be supported within the test chamber so that its lower end will be ¼ in. above the top of the gas burner.

**3-3 Conducting the Flame Test.**

**3-3.1** The gas burner shall be ignited and, with the air supply completely shut off (taping over the air inlet is recommended), shall be adjusted to give a luminous flame 1½ in. long. The ambient light level should be reduced so that the full extent of the flame may be seen for determining flame height.

**3-3.2** The burner shall be moved under the specimen so that the flame is applied vertically to the lower end of the specimen, near the middle of its width. The flame shall be applied for 12 seconds and then withdrawn.

**3-3.3** The duration of flaming combustion of melt drips on the floor of the test chamber shall be measured to the nearest 0.5 second and recorded.

**3-3.4** The duration of burning of the specimen after the igniting flame has been removed shall be measured to the nearest 0.5 second and recorded.

**3-3.5** After all flaming has ceased, purge the enclosure and cabinet with the exhaust fan prior to the next test.

**3-4 Measurement of Length of Char or Material Destruction.**

**3-4.1** After all flaming and afterglow on the specimen has ceased, the length of char or material destruction shall be determined. The length of char in this test is defined as the distance from the end of the specimen that was ex-

posed to the flame to the end of a tear made lengthwise in the specimen through the center of the charred area in the following manner:

(a) The specimen shall be folded lengthwise and creased by hand along the line through the highest point in the charred area.

(b) The hook of the hook/weight assembly is inserted in the specimen, on one side of the charred area, ¼ in. in from the adjacent edge and ¼ in. up from the bottom.

(c) The specimen is then grasped on the opposite side of the charred area with the fingers and raised gently until it supports the weight. The specimen will tear through the charred area until material strong enough to carry the load is reached.

3-4.2 When it is not feasible to measure char, the material destruction can normally be judged as the measurement from the bottom of the sample to a horizontal line above which all material is sound and in original condition.

3-4.3 Specimens that have been weighed before testing shall be reweighed and the percent weight loss calculated. (See 4-1.4.)

## Chapter 4 Flame Resistance Requirements for Small Scale Test

### 4-1 Test Criteria.

4-1.1 When subjected to the small scale test described in Chapter 3 no specimen shall continue flaming for more than two seconds after the test flame is removed from contact with the specimen.

*Exception: This criterion shall not apply to fabrics weighing less than 10.0 ounces per square yard, which are specified as being for use as curtains and draperies [see 9-5(a)].*

4-1.2 The vertical spread of flame and afterglow (smoldering combustion) on the material, as indicated by the length of char or the measurement from the bottom of the sample above which all material is sound and in original condition, shall not exceed the values shown in Table 4-1.

*Exception: Fabrics weighing less than 10.0 ounces per square yard, which are specified as being for use as curtains and draperies [see 9-5(a)], may have a maximum average char length for ten specimens of up to 6.5 in. with no individual value exceeding 7.5 in.*

4-1.3 At no time during or after the application of the test flame shall portions or residues of textiles or films that break or drip from any test specimens continue to flame after they reach the floor of the test chamber.

*Exception: Fragments or residues from fabrics weighing less than 10.0 ounces per square yard, which are specified as being for use as curtains and draperies [see 9-5(a)], may continue to flame for an average of two seconds.*

4-1.4 Some fabrics that are specified as being for use only as curtains and draperies [see 9-5(a)] and weighing less than

3.0 ounces per square yard may fail to meet the char length criteria because of melting beyond the prescribed limits. In such cases, if the weight loss of each specimen is less than 5 percent, the fabric will be considered to meet the char length requirements.

$$\% \text{ weight loss} = \frac{(\text{original weight} - \text{final weight}) \times 100}{\text{original weight}}$$

Table 4-1  
Permissible Length of Char or Destroyed  
Material — Small Scale Test\*

Weight of Material Being Tested (Oz per Sq Yd)	Maximum Average of 10 Specimens (Inches)	Maximum Individual for Each Specimen (Inches)
Over 10	3.5	4.5
Over 5 and not exceeding 10	4.5	5.5
Not exceeding 5	5.5	6.5

\*For fabrics weighing less than 10.0 ounces per square yard, which are specified as being for use only as curtains and draperies [see 9-5(a)], see Exception to 4-1.2.

4-2 Retest. Samples for which only one of the ten specimens does not meet a given classification criterion may be retested using a new set of five specimens taken in the same direction as the specimen that did not meet the criteria. If all five of the new specimens meet the criteria, the sample shall be regarded as meeting the small scale test criteria.

## Chapter 5 Test Apparatus and Materials for Large Scale Test

### 5-1 Conditioning Oven.

5-1.1 A forced draft oven shall be used to condition test specimens properly prior to testing.

5-1.1.1 The interior of the oven shall be large enough to provide free air flow around each specimen contained.

5-1.1.2 The oven shall have variable temperature control capable of maintaining the interior at a temperature of 140-145 °F (60-63 °C).

### 5-2 Test Enclosure.

5-2.1 The test shall be carried out in a metal stack 12 in. square and 7 ft high with details as follows:

(a) The stack shall be supported 1 ft above the floor by legs and shall be open at the top and bottom.

(b) The stack shall be fitted with a wired-glass, or other suitable material, observation window(s) extending the full length of the front door.

(c) The stack shall have means for hanging the specimen as follows:

*Top rod:* ¼ or ½ in. steel rod, 13 in. long sharpened to a point at one end. Holes in both sides of the stack aligned horizontally for location of the top rod.

**Bottom rod:**  $\frac{1}{16}$  in. steel rod, 10 in. long sharpened to a point at one end.

**Vertical guide wires:** Use copper or other suitable wire to make a pair of vertical guide wires on each side of the stack spaced 4 in. to the right and left of the vertical center of the stack, 8 in. apart. The two wires making up each pair shall be spaced 1 in. apart front to back and shall be parallel to each other and to the sides of the stack. Mount the vertical guide wires using a  $\frac{1}{4}$  in. diameter rod fixed horizontally at the top and bottom of the stack. [See Figure 5-2(c).]

5-2.2 The stack shall be located in a room, chamber, or hood where the temperature is 40-75 °F (4-24 °C) and the relative humidity does not exceed 70 percent.

5-2.3 The testing chamber shall be free of drafts that affect the stability of the flame.

5-2.4 Test personnel should be equipped with protective devices if not isolated from the smoke.

5-2.5 Refer to Figures 5-2(a), (b), (c), 6-2(a), (b), and (c) for details regarding enclosure construction and facilities for properly mounting both flat and folded test specimens.

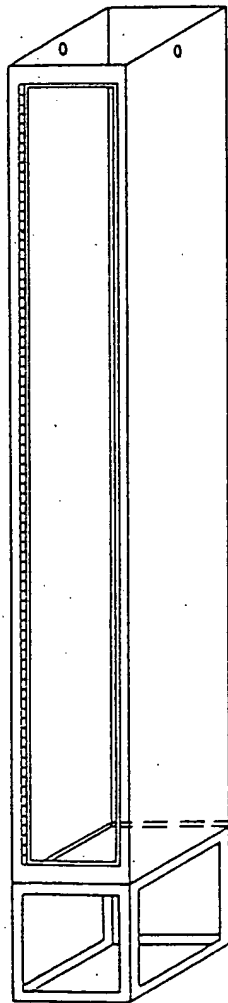


Figure 5-2(a) Orthographic view of flame testing apparatus.

5-3 Restraining Clamps. See 6-2.3.

5-4 Gas Burner. A bunsen burner having  $\frac{3}{8}$ -in. tube diameter shall be used for the ignition source. If the burner is equipped with a gas flow controlling valve the valve shall be fully open so as not to restrict gas flow as the flow must be controlled by the needle valve preceding the rotameter as specified in 5-4.4.

5-4.1 The burner shall be fixed in a position so that the barrel is at a 25 degree angle with the vertical, with the upper tip of the burner 4 in. below the bottom edge of the test specimen.

5-4.2 The gas supply to the burner shall be at least 97 percent methane or manufactured or natural gas having a heat value of 800-1000 Btu per cu ft.

5-4.3 A rotameter shall be installed between the gas flow control valve and the burner. The upper limit of the rotameter shall be from 5 to 10 ft<sup>3</sup>/hr.

5-4.4 A needle valve for gas flow control followed by a rotameter shall be placed in the gas line leading to the burner. A pressure gage shall be located between the gas supply line and the needle valve used for controlling the gas flow. The gas lines from the needle valve to the rotameter and from the rotameter to the burner shall have a bore of  $\frac{1}{4}$  in. and shall not exceed a total length of 5 ft. Armored tubing is recommended for the last 2 ft leading to the burner. (See Figure 5-4.)

5-5 Timer. Stop watches or other timing devices that measure to 0.5 second shall be used to determine afterflame of burning specimens and the flame time of portions of residues that break away or drip from the test specimen and continue to flame after reaching the floor of the test chamber.

5-6 Test Specimens.

5-6.1 Remove selvages from all samples before cutting and conditioning specimens. The test specimens shall be taken from as widely separated and symmetrically located sections as possible over the entire area of the sample of each material. One-half of the specimens shall be cut with the long dimension parallel to the length, and the balance of the specimens shall be cut with the long dimension parallel to the width of the material. It may be necessary to join sections with a flat seam to achieve the necessary 7 ft specimen length when the long dimension is parallel to the width of the material.

5-6.2 For conducting flame tests of materials in flat sheets, at least 10 specimens, 5 in. by 7 ft, shall be used.

5-6.3 For conducting flame tests of materials hung in folds, at least 4 specimens, 24  $\pm$  1 in. by 7 ft  $\pm$  1 in., shall be cut. Each specimen shall be folded longitudinally to form four folds, each approximately 5 in. wide, uniformly over the length. Refer to Figure 6-2(c) to insure a proper folded appearance.

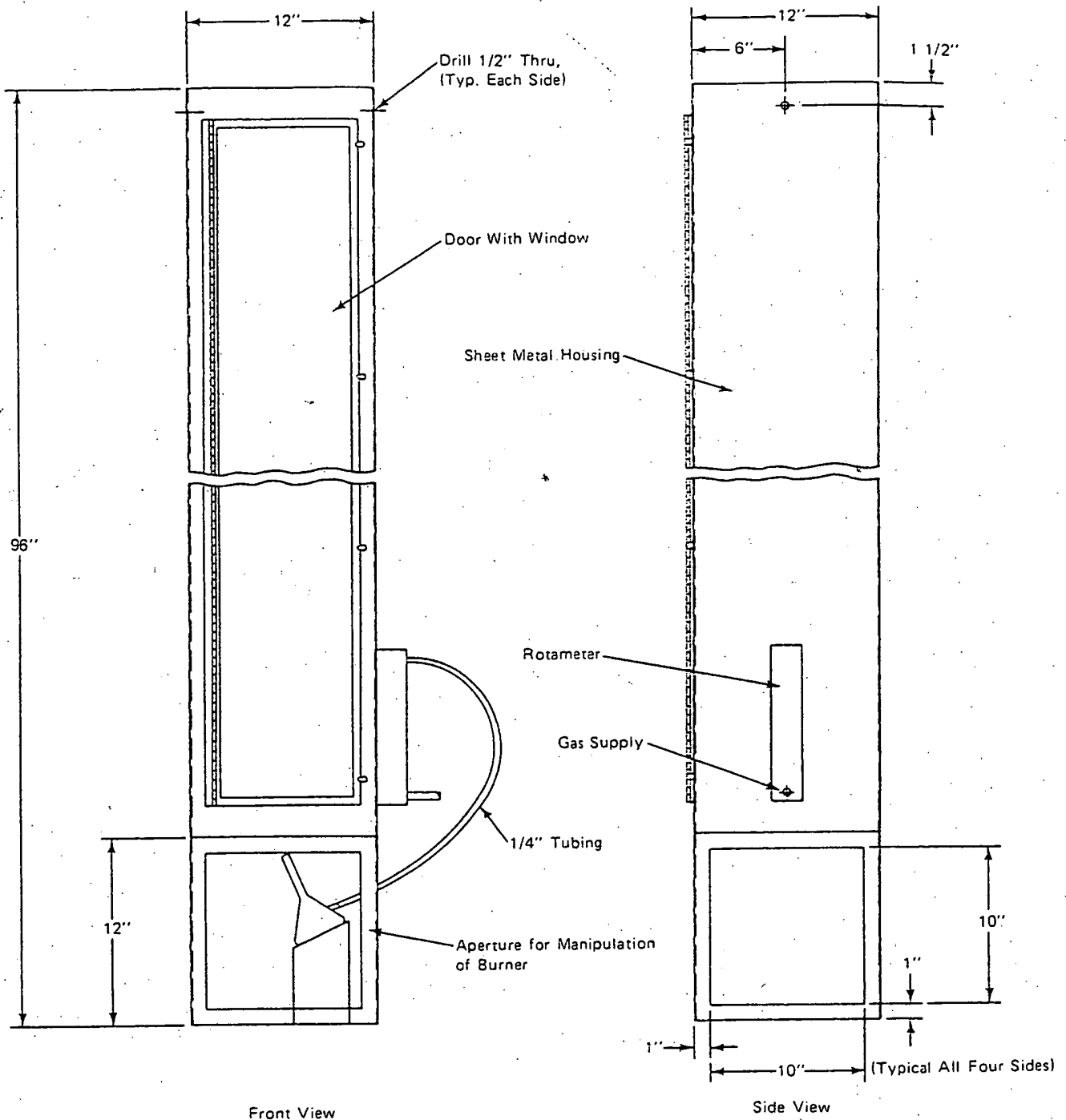


Figure 5-2(b) Outside views of apparatus.

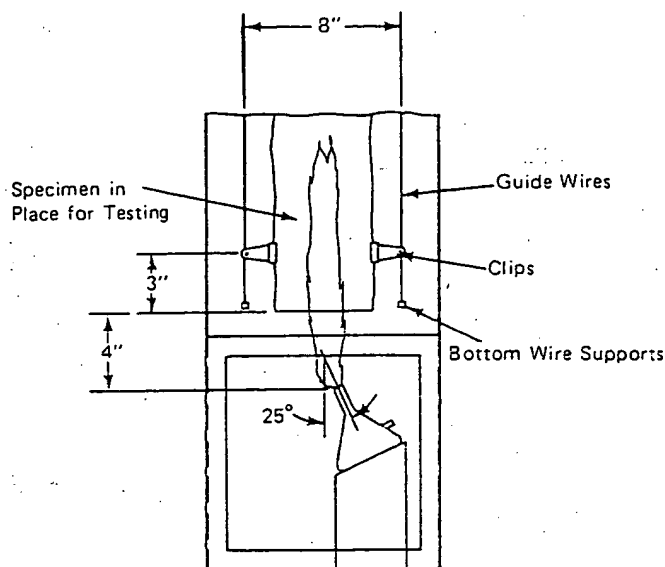


Figure 5-2(c) View inside at bottom of apparatus.

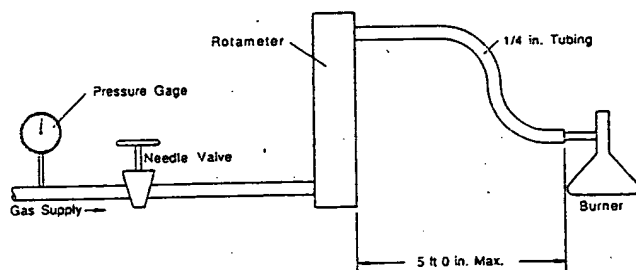


Figure 5-4 Gas line feed arrangement to burner.

## Chapter 6 Flame Test Procedures for the Large Scale Test

### 6-1 Conditioning of Test Specimens.

6-1.1 The test specimens shall be conditioned in an oven, at temperatures of 140-145 °F (60-63 °C), for durations of not less than one hour nor more than one and one-half hours before testing.

6-1.2 Materials that distort or melt at the above indicated oven exposure shall be conditioned at 60-80 °F (15-27 °C) and 25-50 percent relative humidity for not less than 24 hours.

6-1.3 Specimens shall be removed from the oven one at a time and immediately subjected to the procedures described in Sections 6-2 and 6-3.

### 6-2 Mounting of Test Specimens.

6-2.1 The folded specimen shall be suspended vertically with the edges of the folds facing the observer (front of stack). The folds shall be spread apart about 1/2 in. by means

of guide rods inserted at the top to support the specimen and half way down the specimen to help hold the folds in place. The bottom of the center portion of the section between the two middle folds shall be 4 in. above the bunsen burner.

6-2.2 The single flat sheet specimen shall be suspended vertically in the stack with its full width facing the observer (front of stack) so that the center of the bottom of the specimen will be 4 in. above the bunsen burner.

6-2.3 Test specimens shall be lightly restrained laterally at the mid-point of their length and within 3 in. of the bottom edge by suitable clamps (bulldog clips) and light chains attached to the vertical guide wires.

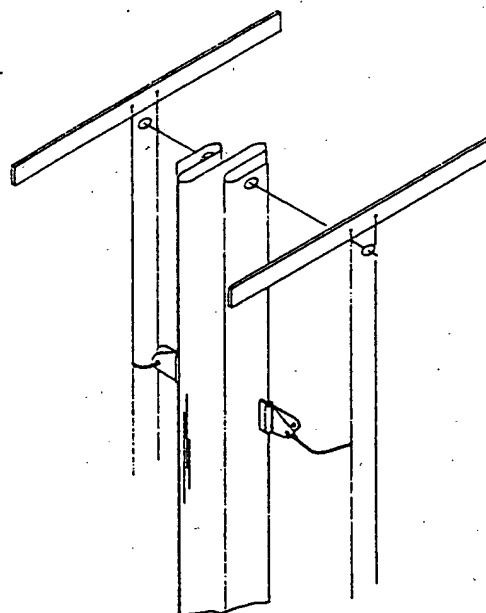


Figure 6-2(a) Test sample in folds.

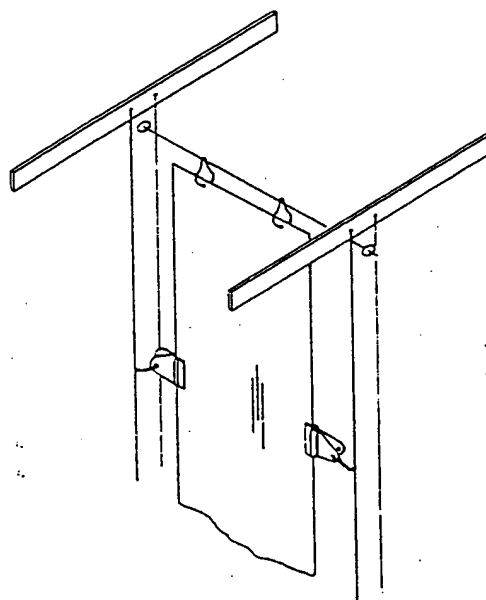
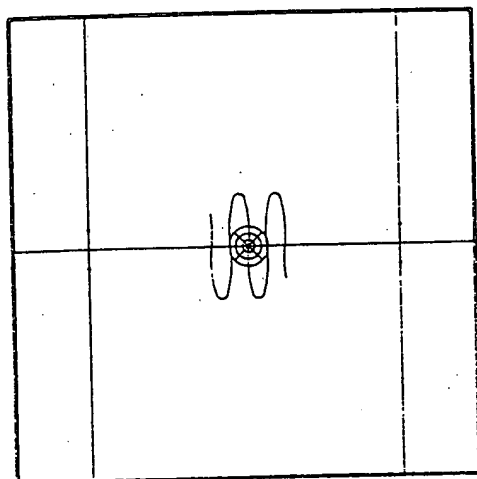


Figure 6-2(b) Test sample flat sheet.



⊗ FLAME APPLICATION POINT

Figure 6-2(c) Bottom view of folded sample.

6-2.4 Refer to Figures 5-2(c), 6-2(a), (b), and (c), for details for properly mounting test specimens.

### 6-3 Conducting the Flame Test.

6-3.1 The gas burner shall be ignited and the gas pressure regulated at 2.25 to 2.75 psi with a flow rate of  $4.0 \pm 0.1$  ft<sup>3</sup>/hr.

6-3.2 The burner air inlets shall be sealed to prevent air from entering, and the gas adjusted to produce an 11 in.  $\pm$  0.5 in. flame. If the flame height cannot be achieved with specified gas pressure and flow rate, the burner may need cleaning or adjustment.

6-3.3 The flame shall be applied vertically near the middle of the width of the lower end of the specimen in a single sheet, or the middle segment of the specimen in folds [see Figure 6-2(c)]. The position of the specimen relative to the test flame shall be maintained by guide wires attached to the outer edges of the specimen. The test flame shall be applied to the specimen for two minutes, then withdrawn.

6-3.4 The duration of flaming combustion of melt drips on the floor of the test chamber shall be measured and recorded to the nearest 0.5 second.

6-3.5 The duration of burning of the specimen after the igniting flame has been removed shall be measured and recorded to the nearest 0.5 second.

6-3.6 After all flaming has ceased, purge the enclosure and stack prior to the next test.

6-4 Measurement of Length of Char. After all flaming and afterglow on the specimen has ceased, the length of char shall be determined. For purposes of this test, the length of char is defined as the vertical distance on the specimen from the top of the test flame to the top of the charred area resulting from spread of flame and afterglow. For synthetic textiles and films the length of char is defined as the vertical distance from the tip of the test flame

to a horizontal line, above which all material is sound and in essentially original condition.

## Chapter 7 Flame Resistance Requirements for the Large Scale Test

### 7-1 Test Criteria.

7-1.1 When subjected to the large scale test described in Chapter 6, no specimen shall continue flaming for more than two seconds after the test flame is removed from contact with the specimen.

7-1.2 The length of char on the individual folded specimens shall not exceed 35 in. above the tip of the test flame. The char length may be determined by measuring from the top of the specimen to the top of the damaged area and this value subtracted from the initial length of the specimen. If this is done the maximum value of the result shall not exceed 42 in. (35 in. plus the 7 in. in the flame).

7-1.3 The length of char on any single specimen of the material in flat sheets shall not exceed 10 in. above the tip of the test flame. This char length shall be measured as the distance from the tip of the test flame to the top of the charred area resulting from spread of flame and afterglow [or the distance from the top of the specimen to the top of the damaged area may be measured and subtracted from the initial length of the specimen, in which case the result must be less than 17 in. (10 in. + the 7 in. that has been exposed to the flame)].

7-1.4 At no time during or after the application of the test flame shall any portions or residues of the material being tested break or drip from the specimen and fall to the floor and continue flaming after reaching the floor of the test apparatus.

### 7-2 Retest.

7-2.1 In the event that one of the four folded specimens fails to meet the above requirements, test two new specimens cut in the same direction as the one that failed. If both of the new specimens meet the criteria, the sample shall be regarded as meeting the large scale test criteria.

7-2.2 In the event that one of the ten flat specimens fails to meet the above requirements, test five new specimens cut in the same direction as the one that failed. If all five of the new specimens meet the criteria, the sample shall be regarded as meeting the large scale test criteria.

## Chapter 8 Cleaning and Weathering Procedures

8-1 General Considerations. The probable durability of a treatment relative to the life of the fabric is difficult to assess but, in general, flame retardant treatments tend to be either very tenacious or quite easily removed.